

**IN THE CLAIMS:**

Please amend the claims as indicated in the following claim set for this application:

1. **(Currently Amended)** A noble metal tip for use with a spark plug electrode, comprising:

a firing end having a sparking surface,

an attachment end, and

a retention feature at least partially surrounded by an outwardly protruding lip and extending generally radially into said noble metal tip from an exposed surface of said noble metal tip said protruding lip, said retention feature being located adjacent said attachment end.

2. **(Previously Presented)** The noble metal tip of claim 1, wherein said noble metal tip has a diameter.

3. **(Previously Presented)** The noble metal tip of claim 2, wherein said retention feature radially extends only partially through the diameter of said noble metal tip.

4. **(Currently Amended)** A noble metal tip for use with a spark plug electrode, comprising:

a firing end having a sparking surface,

an attachment end, and

a retention feature extending generally radially into said noble metal tip from an exposed surface of said noble metal tip, said retention feature being located adjacent said attachment end,

wherein said retention feature radially extends only partially through a diameter of said noble metal tip, and

The noble metal tip of claim 3, wherein said retention feature is of a generally conical shape.

**5. (Cancelled)**

**6. (Previously Presented)** The noble metal tip of claim 3, wherein said retention feature comprises a hole extending inwardly into said noble metal tip.

**7. (Previously Presented)** The noble metal tip of claim 1, wherein said retention feature radially extends into said noble metal tip by a distance that is less than one half of the diameter of said noble metal tip.

**8. (Previously Presented)** The noble metal tip of claim 1, wherein said tip further comprises a plurality of said retention features, and wherein one or more of said features are located at a first axial position along said tip and one or more of said features are located at a second axial position along said tip, said first and second axial positions being spaced from one another.

**9. (Currently Amended)** A noble metal tip for use with a spark plug electrode, comprising:

a firing end having a sparking surface,  
an attachment end, and  
a retention feature extending generally radially into said noble metal tip  
from an exposed surface of said noble metal tip, said retention feature being located  
adjacent said attachment end,

wherein said noble metal tip further comprises a plurality of said retention  
features, and wherein one or more of said features are located at a first axial  
position along said tip and one or more of said features are located at a second axial  
position along said tip, said first and second axial positions being spaced from one  
another, and

**The noble metal tip of claim 8,** wherein first and second retention features are located at said first axial position and are circumferentially spaced from one another by approximately 180°, and third and fourth retention features are located at said second axial position and are circumferentially spaced from one another by approximately 180°.

10. **(Previously Presented)** The noble metal tip of claim 9, wherein said retention features comprise holes extending inwardly into said noble metal tip.

11. **(Original)** The noble metal tip of claim 1, wherein said noble metal tip is comprised of an Ir-based material.

12. **(Original)** An electrode assembly including the noble metal tip of claim 1.

13. **(Original)** A spark plug including the electrode assembly of claim 12.

14. **(Currently Amended)** A center electrode assembly for use in a spark plug, comprising:

a center electrode component including a front end having a blind bore formed therein,

a generally cylindrical noble metal tip secured within said blind bore, said tip including:

a firing end having a sparking surface,

an attachment end located within said blind bore, and

a preformed retention feature, and

a fusion layer that extends into said preformed retention feature without mechanical deformation of said center electrode component front end, and locks said noble metal tip to said center electrode.

15. **(Previously Presented)** The center electrode assembly of claim 14, wherein said tip further comprises a plurality of said retention features, and wherein one or more of said features are located at a first axial position along said tip and one or more of said features are located at a second axial position along said tip, said first and second axial positions being spaced from one another.

16. **(Previously Presented)** The center electrode assembly of claim 14, wherein said sparking surface protrudes beyond the end of said center electrode front end by a distance between 0.1mm-1.0mm.

17. **(Original)** The center electrode assembly of claim 14, wherein said sparking surface has a diameter between 0.25mm-1.0mm.

18. **(Original)** The center electrode assembly of claim 14, wherein said noble metal tip is comprised of an Ir-based material.

19. **(Original)** The center electrode assembly of claim 14, wherein said center electrode component is comprised of a nickel-based material having a thermal conductivity of greater than 30 W/mK during normal spark plug operating temperatures.

20. **(Original)** A spark plug including the center electrode assembly of claim 14.

21-26. **(Canceled)**

27. **(Previously Presented)** The center electrode assembly of claim 14, wherein said retention feature radially extends only partially through the diameter of said noble metal tip.

28. **(Currently Amended)** A center electrode assembly for use in a spark plug, comprising:

a center electrode component including a front end having a blind bore formed therein,

a generally cylindrical noble metal tip secured within said blind bore, said tip including:

a firing end having a sparking surface,

an attachment end located within said blind bore, and

a preformed retention feature, and

a fusion layer that extends into said preformed retention feature and locks said noble metal tip to said center electrode,

wherein said retention feature radially extends only partially through a diameter of said noble metal tip, and

~~The center electrode assembly of claim 27~~, wherein said retention feature is of a generally conical shape.

29. **(Previously Presented)** The center electrode assembly of claim 27, wherein said retention feature comprises a groove that extends around the entire circumference of said noble metal tip.

30. **(Previously Presented)** The center electrode assembly of claim 27, wherein said retention feature comprises a hole extending inwardly into said noble metal tip.

31. **(Previously Presented)** The center electrode assembly of claim 14, wherein said retention feature radially extends into said noble metal tip by a distance that is less than one half of the diameter of said noble metal tip.

32. **(Currently Amended)** A center electrode assembly for use in a spark plug, comprising:

a center electrode component including a front end having a blind bore formed therein,  
a generally cylindrical noble metal tip secured within said blind bore, said tip including:  
a firing end having a sparking surface,  
an attachment end located within said blind bore, and  
a preformed retention feature, and  
a fusion layer that extends into said preformed retention feature and locks said noble metal tip to said center electrode,  
wherein The center electrode assembly of claim 14, said noble metal tip further ~~comprising~~ comprises a plurality of said retention features, wherein first and second retention features are located at a first axial position and are circumferentially spaced from one another by approximately 180°, and third and fourth retention features are located at a second axial position and are circumferentially spaced from one another by approximately 180°.

33. **(Previously Presented)** An electrode assembly for a spark plug, comprising:

- an electrode;
- a noble metal tip having an attachment end and a firing end that includes a sparking surface, said attachment end being recessed into said electrode;
- wherein said noble metal tip includes one or more recessed retention features extending inwardly into said tip from a peripheral surface of said tip at a location intermediate said attachment end and said firing end; and
- wherein said tip is locked to said electrode by material that: i) includes electrode material without any significant amount of noble metal material, ii) extends into said one or more recessed retention features, and iii) conforms with the shape of said one or more recessed retention features.

34. **(Previously Presented)** The electrode assembly of claim 33, wherein said electrode comprises a center electrode.

35. **(Previously Presented)** The electrode assembly of claim 33, wherein said one or more retention features comprises a plurality of holes including first and second holes angularly spaced from each other about said peripheral surface of said tip.

36. **(Previously Presented)** The electrode assembly of claim 35, wherein said first and second holes are located at a common axial position on said tip.

37. **(Previously Presented)** The electrode assembly of claim 35, wherein said first and second holes are axially spaced from each other.

38. **(Previously Presented)** The electrode assembly of claim 35, wherein said plurality of holes comprises four holes.

39. **(Currently Amended)** An electrode assembly for a spark plug, comprising:

- a center electrode;
- a noble metal tip having an attachment end and a firing end that includes a sparking surface, said attachment end being recessed into said center electrode;

wherein said noble metal tip includes one or more preformed retention features extending inwardly into said tip from a peripheral surface of said tip at a location intermediate said attachment end and said firing end; and

wherein said tip is secured to said center electrode by a localized, laser-formed fusion layer that extends into said one or more preformed retention features.

40. (Currently Amended) An electrode assembly for a spark plug, comprising:  
a center electrode;  
a noble metal tip having an attachment end and a firing end that includes a  
sparking surface, said attachment end being recessed into said center electrode;  
wherein said noble metal tip includes one or more preformed retention  
features extending inwardly into said tip from a peripheral surface of said tip at a  
location intermediate said attachment end and said firing end; and  
wherein said tip is secured to said center electrode by a fusion layer that  
extends into said one or more preformed retention features, and

~~The electrode assembly of claim 39~~, wherein said fusion layer includes only material from said center electrode, whereby said tip is locked to said center electrode.

41. (Currently Amended) The electrode assembly of claim 39, wherein said tip is welded to said center electrode by said localized laser formed fusion layer, whereby said localized laser formed fusion layer includes material from both said tip and said center electrode.

42.-47. (Cancelled)